

Measurements (No. 18066, female). — Length 30·5 millim.; reatest width 38; width between postorbital spines 19.

The male is unknown.

This species can be distinguished from other *Thelphusidæ* by its produced round-lobed front, narrow orbits, and numerous spines.—*Proc. Nat. Mus.* vol. xvii. no. 980, pp. 25–27. (Communicated by the Author.)

The Dipterous Parasites (Sarcophagidæ) of Locusts.—Apteny and Parasitic Sterilization. By M. J. KÜNCKEL D'HERCULAIS.

Among Diptera the countless species comprised in the family *Muscidæ* furnish their contingent of enemies of the Locust, some of which attack their victims in the perfect stage, while others prey upon the eggs which are deposited in the ground; not content with playing a beneficent rôle in contributing to a large degree to arrest the multiplication of the Acridians, they present biological peculiarities and possess physiological attributes which are worthy of being recorded.

We shall devote our attention in the first instance to the *Muscidæ* which prey upon Acridians.

At the time of the great invasion of Northern Africa by migratory locusts in 1866 it was found at different points in Algeria (military subdivisions Aumale and Médéah) that *Muscid* larvæ were present in a certain number of these insects*. In 1889 the considerable invasion of *Stauronotus maroccanus* gave an opportunity of making fresh observations in the Department of Constantine, in civil as well as in military territory; I myself found around Constantine, which was besieged by the Acridians, that a quantity of *Stauronotus*, as well as of other species, were affected; but it was not until the year 1890, at Teniet-el-Haad (Department of Algiers), that I was able to carry out methodical investigations. Just as in the previous year, I observed everywhere where the bands of locusts, escaping from destruction, had acquired their wings, that numbers of individuals crawled along among the herbage without having been able to follow their companions, the flights of which traversed the air. I had some sacks full of them collected: a few days afterwards some hundreds of larvæ were crawling at the bottom of these sacks. If the return of 1889 † showed that 65 per cent. of the locusts lagging behind were infected with parasites, that which I made in 1890 gives the number thus affected as 75 per cent., and a post-mortem examination revealed the fact that each *Stauronotus* contained one, two, or three *Muscid* larvæ.

These larvæ hid themselves immediately in earth which was supplied to them in order to undergo the transformation into the

* Letter of the General of Division commanding the province of Algiers (General de Wimpffen) to the Marshal the Governor of Algeria (Marshal MacMahon), 25th July and 5th August, 1866: registered nos. 2541 and 2776.

† Return drawn up at my initiative by the exertions of M. L. Tardieu, administrator of the mixed commune of R'hiras (Department of Constantine). Observations of M. Chartrousse, deputy-administrator.

pupal stage; after the lapse of from eight to ten days the pupæ produced specimens of *Sarcophaga clathrata*, Meigen*.

This Muscid is widely distributed in Algeria: I have bred it from larvæ derived from *Stauronotus maroccanus* as well as from *Aceridium egyptium* and other indigenous species; but it is not the only Sarcophagid which in that country may be parasitic upon Acridians; from specimens of *Stauronotus* I have observed larvæ emerge which have developed into *Sarcophaga atropos*, Meigen, *S. eruentata*, Meigen, and *S. nurus*, Rondani; and from migratory locusts larvæ which have produced *S. (Acria) affinis*, Fallén, and likewise *S. nurus*, Rondani †; this latter is, moreover, a common species.

The larvæ of the parasitic species of *Sarcophaga* are admirably adapted for passing their existence in the body-cavities of their hosts, and differ in a remarkable manner from those which live in the open air in dead bodies—from those of *S. carnaria*, L., for example; they have neither the form nor the external aspect of common maggots ‡: the posterior stigmata, which are situated upon the last ring of the abdomen, are placed at the bottom of a cavity, which can be closed more or less completely by means of an upper and two lower lips; they are composed, in larvæ which have attained their full size, of three pairs of oblique clefts. The arrangement of the external organs of respiration is in itself alone sufficiently characteristic to justify the separation of the parasitic Sarcophagids from their congeners.

The habits of the adult insects are no less specialized. The viviparous flies follow the bands of locusts, which they harass unceasingly. If we possess the requisite patience we may sometimes surprise a female in the act of inserting her curved oviduct between the anal plates of the victim, which she has selected in order to deposit thereon a tiny larva, girdled with several rows of spinules, which will be able to open a passage for itself in order to penetrate the body of the insect which is destined to harbour it.

This parasitism, owing to its physiological consequences, is of the first importance, for in the case of the locusts it destroys the power of aerial locomotion and suppresses the reproductive faculty. By absorbing for their own respiration the oxygen dissolved in the sanguineous plasma of their host, and by devouring the adipose tissue from which the latter has to derive the constructive principles of the organic elements of new formation, the larvæ of the *Sarcophaga* are the cause of a general insufficiency of nutriment for the tissues; they smite with impotence the elevator and depressor

* Bull. de la Soc. d'Agr. d'Alger, 34^e année: Bull. no. 103, 1891, p. 47 (séance du 15 mai, 1891). *Dépêche algérienne*, no. 2111, 19 mai, 1891.

† A preliminary determination of the species was made according to the types of Meigen and Macquart, preserved in the collections of the Museum; a second and independent determination, which served to control the former, was solicited from Dr. R. H. Meade, of Bradford, who is so widely known for his knowledge of the Muscidae, and to whom I here convey my best thanks. Cf. J. Künckel d'Herculeis, 'Les invasions des Acridiens, vulgo Sauterelles, en Algérie,' pl. i. *S. clathrata*, larva and adult, figs. 20–22; *S. nurus*, fig. 23; *S. affinis*, fig. 24.

‡ *Loc. cit.* pl. i. fig. 20, a, b, and c.

muscles of the elytra and wings, which remain in a feeble condition and incapable of continuous action, and they induce atrophy of the internal organs of generation. The intensity of the arrested development and atrophy is, we may conceive, proportional to the number of larvæ that are contained in the body-cavity of the victim; but, at any rate, the infected Acridians perish immediately the Muscid larvæ have left them; the exit of the larvæ, which is effected at the junction of the head with the thorax, or of the thorax with the abdomen, from the tympanic cavities or the intervals of the abdominal rings, is always accompanied by mortal lesions.

The presence of Sarcophagid larvæ consequently occasions in Acridians, by a kind of rachitis, *apteny* (ἀπτην, fightless), to use a neologism which it seems to me useful to create, and *parasitic sterilization* ("castration parasitaire"), to employ the happy expression of Prof. Giard*.

To the already long list of *gonotomous* parasites, furnished by this naturalist, we shall have to add the larvæ of entomobious Diptera.—*Comptes Rendus*, t. cxviii. no. 20 (May 15, 1894), pp. 1106–1108.

The Distribution of Coccidæ. By T. D. A. COCKERELL,
Las Cruces, New Mexico †.

It would be difficult to point to any group of insect pests the ravages of which have been more seriously increased by human interference than the Coccidæ. As a general rule when one finds Coccids under strictly natural circumstances they are local in their distribution, and their attacks are confined to one or two species of plants. But now that we continually carry plants from one country to another, we take with them Coccidæ of many kinds; and already some scale-insects are so cosmopolitan by human introduction, that it is very difficult to guess where they originally came from.

It is a matter of common knowledge amongst economic entomologists that the evils thus arising are on the increase; and I would submit that the outlook is a very serious one ‡. Even in the temperate zone we have become familiar with the injuries done by Coccidæ in countries where they are not indigenous; but in the tropics the state of affairs is beyond anything one could easily imagine without having seen it. Coming to New Mexico from Jamaica I experienced a kind of surprise at not seeing the leaves of the roadside trees spotted with Diaspinæ and Lecaniinæ, although I knew quite well that such appearances were not to be looked for

* A. Giard, "La Castration parasitaire et son influence sur les caractères extérieurs chez les Crustacés décapodes" (Bull. sc. du Départ. du Nord, 2^e série, 10^e année, 1887, nos. 1 and 2, p. 1); "La Castration parasitaire: nouvelles recherches" (Bull. sc. de la France et de la Belgique, 3^e série, t. xix. vol. i. 1888, pp. 12 *et seq.*). See also the subsequent memoirs upon the same subject.

† Read by the secretary, in the absence of the author, at the Fifth Annual Meeting of the Association of Economic Entomologists, held at the University of Wisconsin, Aug. 14, 1893.

‡ I here assume that anything which decreases the food-supply of the human race is disadvantageous. This is not the place to discuss those artificial conditions whereby abundance is made a cause of scarcity, and the wealth of some depends upon the want of others.